Math Achievement Rubric for Knollwood Report Card Grade 5

12/2/2011 1:38 PM

Performance Indicators	Rubric
Understands the meanings, uses and representations of numbers	3 • Reads whole numbers and decimals • Writes whole numbers and decimals • Identifies places in whole numbers and decimals and the value of the digits in those places • Uses expanded notation to represent whole numbers and decimals • Solves problems involving percents and discounts and explains strategies • Identifies the unit whole in situations involving fractions • Identifies prime and composite numbers • Factors numbers • Finds prime factorizations
	2 • Reads and writes whole numbers up to 1,000,000,000 and decimals through thousandths • Identifies places in such numbers and values of the digits in those places • Translates between whole numbers and decimals represented in words and in base-10 notation • Reads, writes and models fractions • Solves problems involving fractional parts of a region or a collection and describes strategies • Given a fraction part of a region or a collection, identifies the unit whole • Finds multiples of whole numbers less than 10 • Finds whole-number factors
	1 • Reads and writes whole numbers up to 1,000,000

	• Reads, writes, and models with manipulatives decimals through hundredths • Identifies places in such numbers and the values of the digits in those places • Translates between whole numbers and decimals represented in words, in base-10 notation,and with manipulatives • Reads, writes, and models fractions • Solves problems involving fractional parts of a region or a collection • Describes strategies used
	E • Reads and writes whole numbers and decimals • Identifies places in such numbers and the values of the digits in those places • Uses expanded notation, number-and-word notation, exponential notation, and scientific notation to represent whole numbers and decimals • Solves problems involving percents and discounts • Explains strategies used • Identifies the unit whole in situations involving fractions, decimals, and percents • Uses GCFs, LCMs, and divisibility rules to manipulate fractions
Understands equivalent names for numbers	3 • Uses numerical expressions involving one or more of the basic four arithmetic operations, grouping symbols, and exponents to give equivalent names for whole numbers • Converts between base-10, exponential, and repeated-factor notations • Uses numerical expressions to find and represent equivalent names for fractions, decimals, and percents • Uses and explains multiplication and division rules to find equivalent fractions and fractions in simplest form • Converts between fractions and mixed numbers • Converts between fractions, decimals, and percents
	2 • Uses numerical expressions involving one or more of the basic four arithmetic operations and grouping symbols to give equivalent names for whole numbers

	• Uses numerical expressions to find and represent equivalent names for fractions and decimals • Uses and explains a multiplication rule to find equivalent fractions • Renames fourths, fifths tenths, and hundredths as decimals and percents
	1 • Uses numerical expressions involving one or more of the basic four arithmetic operations to give equivalent names for whole numbers • Uses manipulatives and drawings to find and represent equivalent names for fractions • Uses manipulatives to generate equivalent fractions
	E • Applies the order of operations to numerical expressions to give equivalent names for rational numbers • Finds equivalent fractions and fractions in simplest form by applying multiplication and division rules and concepts from number theory • Converts between fractions, mixed numbers, decimals, and percents
Understands common numerical relations	3 • Compares and orders rational numbers • Uses area models, benchmark fractions and analyses of numerators and denominators to compare and order fractions and mixed numbers • Describes strategies used to compare fractions and mixed numbers
	2 • Compares and orders whole numbers up to 1,000,000,000 and decimals through thousandths • Compares and orders integers between -100 and 0 • Uses area models, benchmark fractions and analyses of numerators and denominators to compare and order fractions
	1 • Compares and orders whole numbers up to 1,000,000

	• Uses manipulatives to order decimals through hundredths • Uses area models and benchmark fractions to compare and order fractions
	E • Chooses and applies strategies for comparing and ordering rational numbers • Explains those choices and strategies
Understands the systems and processes of measurement: uses appropriate techniques, tools, units, and formulas in making measurements	3 • Estimates length with and without tools • Measures length with tools to the nearest 1/8 inch and millimeter • Estimates the measure of angles with and without tools • Uses tools to draw angle with given measures • Describes and uses strategies to find the perimeter of polygons and the area of circles • Chooses and uses appropriate formulas to calculate the areas of rectangles, parallelograms, and triangles, and the volume of a prism • Defines pi as the ratio of a circle's circumference to its diameter • Describes relationships among U.S. customary units of length, among metric units of length, and among U.S. customary units of capacity
	2 • Estimates length with tools • Measures length with tools to the nearest 1/4 inch and ½ centimeter • Estimates the size of angles without tools • Describes and uses strategies to measure the perimeter and area of polygons, to estimate the area of irregular shapes, and to find the volume of rectangular prisms • Describes the relationships among U.S. customary units of length and among metric units of length
	1 • Estimates length with and without tools • Measures length to the nearest ½ inch and ½ centimeter • Draws and describes angles as records of rotations

	• Describes and uses strategies to measure the perimeter of polygons • Counts unit squares to find the areas of rectangles • Describes relationships among inches, feet, and yards • Describes relationships between minutes in an hour, hours in a day, days in a week
	E • Estimates length with and without tools • Measures length with tools to the nearest 1/16 inch and millimeter • Estimates the measure of angles with and without tools • Uses tools to draw angles with given measures • Chooses and uses appropriate formulas to calculate the circumference of circles and to solve area, perimeter, and volume problems
Uses and understands reference frames	3 • Uses ordered pairs of numbers to name, locate, and plot points in all four quadrants of a coordinate grid
	2 • Uses ordered pairs of numbers to name, locate, and plot points in the first quadrant of a coordinate grid
	1 • Uses ordered pairs of numbers to name and locate points in the first quadrant of a coordinate grid
	E • Uses ordered pairs of numbers to name, locate, and plot points in all four quadrants of a coordinate grid
Computes accurately	3 • Uses mental arithmetic, paper-and-pencil algorithms, diagrams, area models, and calculators to solve the following types of problems: ❖ Addition and subtraction with whole numbers, decimals, and signed numbers ❖ Multiplication of whole numbers and decimals and the division of multidigit whole numbers and decimals by whole numbers ❖ Addition and subtraction of fractions and mixed numbers

	❖ Multiplication of fractions and mixed numbers ❖ Division of fractions • Expresses remainders as whole numbers or fractions as appropriate • Describes the strategies used and explains how they work
	2 • Uses manipulatives, mental arithmetic, paper-and-pencil algorithms, and calculators to solve the following types of problems ❖ Addition and subtraction of whole numbers and decimals through hundredths ❖ Multiplication of multidigit whole numbers by 2-digit whole numbers and the division of multidigit whole numbers by 1-digit whole numbers ❖ Addition and subtraction of fractions with like and unlike denominators • Tells the strategies used
	1 • Demonstrates automaticity with all addition and subtraction facts through 10 + 10 • Uses basic facts to compute fact extensions such as 80 + 70 • Uses manipulatives, mental arithmetic, paper-and-pencil algorithms, and calculators to solve problems involving the addition and subtraction of whole numbers and decimals in a money context • Demonstrates automaticity with x 0, x 1, x 2, x 5, and x 10 multiplication facts • Uses strategies to compute remaining facts up to 10 x 10 • Uses arrays, mental arithmetic, paper-and-pencil algorithms, and calculators to solve problems involving the multiplication of 2- and 3-digit whole numbers by 1- digit whole numbers
	E • Uses mental arithmetic, paper-and-pencil algorithms, and calculators to solve the problems with whole numbers, decimals, signed numbers, fractions, and mixed numbers
Makes reasonable estimates	3 • Makes reasonable estimates for whole number and decimal problems • Makes reasonable estimates for fraction and mixed number problems

	• Explains how the estimates were obtained
	2 • Makes estimates for whole number and decimal problems using calculations that are sometimes inaccurate • Indicates how the estimates were obtained
	1 • Makes reasonable estimates for whole number addition and subtraction problems • Explains how the estimates were obtained
	E • Makes reasonable estimates for whole number, decimal, fraction, and mixed number addition, subtraction, multiplication, and division problems • Explain how the estimates were obtained
Understands meanings of operations	3 • Uses repeated addition, arrays, and area to model multiplication and division • Uses ratios expressed as words, fractions, percents, and with colons • Solves problems involving ratios of parts of a set to the whole set
	2 • Uses repeated addition, skip counting, arrays, and area to model multiplication and division • Given a model or equivalency chart, uses ratios expressed as words, fractions, percents, and with colons • Solves problems involving ratios of parts of a set to the whole set when the parts and whole have been previously defined
	1 • Recognizes and describes change, comparison, and parts-and-totals situations • Uses repeated addition, arrays, and skip counting to model multiplication • Uses equal sharing and equal grouping to model division

	E • Uses ratios and scaling to model size changes and to solve size-change problems • Represents ratios as fractions, percents, and decimals, and using a colon • Models and solves problems involving part-to-whole and part-to- part ratios • Models rate and ratio number stories with proportions • Uses and explains cross multiplication and other strategies to solve proportions
Knows basic facts (per grade-level expectations)	3 • When presented with a math fact, can give answer orally or in written form immediately and correctly, without hesitation • Mental math reflects secure knowledge of math facts • Written work shows evidence of secure knowledge of math facts
	2 • When presented with a math fact, can give answer orally or in written form within a few seconds, and, generally, it is correct • Mental math reflects developing knowledge of math facts • Written work shows evidence of developing knowledge of math facts
	1 • When presented with a math fact, can give answer orally or in written form with some hesitation, and it is sometimes correct • Mental math reflects some knowledge of math facts • Written work shows evidence of some knowledge of math facts
	E • When presented with a math fact, can give answer orally or in written form immediately and correctly, without hesitation • Mental math reflects secure knowledge of math facts • Written work shows evidence of secure knowledge of math facts • Math facts memorized beyond grade-level benchmarks
Investigates characteristics and properties of 2- and 3-dimensional geometric shapes	3 • Identifies, describes, compares, names, and draws right, acute, obtuse, straight, and reflex angles

	• Determines angle measures in vertical and supplementary angles and by applying properties of sums of angle measures in triangles and quadrangles
	2 • Given a word bank, identifies and draws right, acute, straight, and obtuse angles • Given the properties of sums of angle measures in triangles and quadrangles, can determine angle measures in vertical and supplementary angles
	1 • Identifies and draw points, intersecting and parallel line segments and lines, rays, and right angles • Identifies, describes, models, and compares plane and solid figures including circles, polygons, spheres, cylinders, rectangular prisms, pyramids, cones, and cubes using appropriate geometric terms including the terms face, edge, vertex, and base
	E • Identifies, describes, classifies, names and draw angles • Determines angle measures by applying properties of orientations of angles and of sums of angle measures in triangles and quadrangles • Identifies and describes similar and congruent figures and describes their properties • Constructs a figure that is congruent to another figure using compass and straightedge
Applies transformations and symmetry in geometric situations	3 • Identifies, describes, and sketches examples of reflections, translations, and rotations
	2 • Identifies, describes, and sketches examples of reflections • Identifies and describes examples of translations and rotations
	1 • Creates and completes 2-dimensional symmetric shapes or designs • Locates multiple lines of symmetry in a 2-dimensional shape

	E • Identifies, describes, and sketches (including plotting on the coordinate plane) instances of reflections, translations, and rotations
Selects and creates appropriate graphical representations of collected or given data	3 • Collects and organizes data or uses given data to create bar, line, and circle graphs with reasonable titles, labels, keys, and intervals
	2 • Collects and organizes data or uses given data to create charts, tables, bar graphs, line plots, and line graphs
	1 • Collects and organizes data or uses given data to create charts, tables, bar graphs, and line plots
	E • Collects and organizes data or uses given data to create bar, line, circle, and stem-and-leaf graphs with reasonable titles, labels, keys, and intervals
Analyzes and interprets data	3 • Uses the maximum, minimum, range, median, mode, and mean and graphs to ask and answer questions, draw conclusions, and make predictions
	2 • Uses the maximum, minimum, range, median, mode, and graphs to ask and answer questions
	1 • Uses graphs to ask and answer simple questions and draw conclusions • Finds the maximum, minimum, range, mode, and median of a data set
	E • Uses the minimum, range, median, mode, and mean and graphs to ask and answer questions, draw conclusions, and make predictions • Compares and contrasts the median and mean of a data set
Understands and applies basic concepts of probability	3 • Describes events using certain, very likely, likely, unlikely, very unlikely, impossible

	and other basic probability terms • Uses more likely, equally likely, same chance, 50-50, less likely, and other basic probability terms to compare events • Explain the choice of language • Predicts the outcomes of experiments, tests the predictions using manipulatives, and summarizes the results • Compares predictions based on theoretical probability with experimental results • Uses summaries and comparisons to predict future events • Expresses the probability of an event as a fraction, decimal, or percent
	2 • Describes events using certain, very likely, likely, unlikely, very unlikely, impossible and other basic probability terms • Uses more likely, equally likely, same chance, 50-50, less likely, and other basic probability terms to compare events • Explain the choice of language • Predicts the outcomes of experiments and tests the predictions using manipulatives • Summarizes the results and uses them to predict future events • Expresses the probability of an event as a fraction
	1 • Describes events using certain, very likely, likely, unlikely, very unlikely, impossible, and other basic probability terms • Explains the choice of language • Predicts the outcomes of simple experiments and tests the predictions using manipulatives • Expresses the probability of an event by using "___ out of ___"
	E • Uses the Multiplication Counting Principle, tree diagrams, and other counting strategies to identify all possible outcomes for a situation • Predicts results of experiments, tests the predictions using manipulatives, and summarizes the findings

	• Compares predictions based on theoretical probability with experimental results • Calculates probabilities and expresses them as fractions, decimals, and percents • Explains how sample size affects results • Uses the results to predict future events
Understands patterns and functions	3 • Extends, describes, and creates numeric patterns • Describes rules for patterns and uses them to solve problems • Writes rules for functions involving the four basic arithmetic operations • Represents functions using words, symbols, tables, and graphs and uses those representations to solve problems
	2 • Extends, describes, and creates numeric patterns • Describes rules for patterns and uses them to solve problems • Uses words and symbols to describe and write rules for functions that involve the four basic arithmetic operations and use those rules to solve problems
	1 • Extends, describes, and creates numeric patterns • Describes rules for patterns and uses them to solve problems • Uses words and symbols to describe and write rules for functions involving addition, subtraction, and multiplication and uses those rules to solve problems
	E • Extends, describes, and creates numeric patterns • Describes rules for patterns and uses them to solve problems • Represents patterns and rules using algebraic notation • Represents functions using words, algebraic notation, tables and graphs • Translates from one representation to another and uses representations to solve problems involving functions
Uses algebraic notation to represent and analyze situations and structures	3 • Determines whether number sentences are true or false • Solves open number sentences and explains the solutions

	• Uses a letter variable to write an open sentence to model a number story • Uses a pan-balance model to solve linear equations in one unknown • Evaluates numeric expressions containing grouping symbols and nested grouping symbols • Inserts grouping symbols and nested grouping symbols to make number sentences true • Describes and uses the precedence of multiplication and division over addition and subtraction • Describes and applies the properties of arithmetic
	2 • Uses conventional notation to write expressions and number sentences using the four basic arithmetic operations • Determines whether number sentences are true or false • Solves open sentences and explains the solutions • Writes expressions and number sentences to model number stories • Evaluates numeric expressions containing grouping symbols • Inserts grouping symbols to make number sentences true • Applies the Distributive Property of Multiplication over Addition to the partial-products multiplication algorithm
	1 • Reads, writes, and explains number sentences using the symbols +, -, x, /, =, >, < • Solves number sentences • Writes expressions and number sentences to model number stories • Recognizes that numeric expressions can have different values depending on the order in which operations are carried out • Understands that grouping symbols can be used to affect the order in which operations are carried out • Describes and applies the Commutative and Associative Properties of Addition, the Commutative Property of Multiplication, and the Multiplicative Identity

	E • Determines whether equalities and inequalities are true or false • Solves open number sentences and explains the solutions • Uses a pan-balance model to solve linear equations in one or two unknowns • Uses trial and error and equivalent equations strategies to solve linear equations in one unknown • Describes and applies the conventional order of operations • Describes and applies the properties of arithmetic and multiplicative and additive inverses
Applies concepts and skills previously learned to solve multi-step problems	3 • Analyzes problems, identifies components, and then formulates plan for solving • Extends, modifies, or reformulates methods as solution unfolds • Can support numeric solutions with graphical representations • Uses prescribed graphical representations and/or physical objects to solve problems or illustrate solutions • Explains solutions to problems using sentences/paragraphs in speaking or writing • Makes overt connections with graphical or pictorial representations • Uses mathematical terminology appropriate to the situation
	2 • Uses prescribed processes to solve problems • Can use alternate processes to solve problems following demonstration of such • Graphical representations accompany solutions when required • Can use alternate processes to solve problems following demonstrations of such • Describes process of solving problems with simple sentences or bulleted phrases • Sketches of physical objects, simple graphic organizers, or graphs to represent the situation sometimes accompany written responses • Mathematical terminology included in the problem can be included in explanation of solution
	1 • Uses parts of given processes to begin to solve problems

	• Graphical representations serve as add-on to solutions • Uses parts of given processes to begin to solve problems • Names parts of solution • Tells about problem using some mathematical terms given in problem • Sketches or graphs are sometimes presented with solution but are not always clearly linked
	E • Designs methods of solving problems based on analysis and application of given theories and knowledge in new situations • Provides counter examples in order to prove solutions • Chooses to use graphical representations and/or physical objects in unorthodox ways to solve problems or illustrate solutions • Provides counter examples in order to prove solutions • Designs methods of solving problems based on analysis and application of given theories and knowledge in new situations • Convinces others that solutions to problems are plausible and supports his/her thinking by using sentences/paragraphs in speaking or writing and makes clear and overt connections with graphical or pictorial representations • Communications always contain appropriate and sophisticated mathematical language and notations